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## An unusual case of prone position in the Punic/Roman Necropolis of Monte Luna in Sardinia (Italy): a multi-disciplinary interpretation of Tomb 27

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Abstract:	<p>Sardinia (Italy), noted for its wealth and strategic position, has been conquered through time by different populations and each one of them instilled their specific culture, ritual behaviour, and customs. Sometimes a clearcut distinction is evident between these cultures, while other times it is more of a natural progression with no marked moment of change evident. This study discusses a single grave from the Necropolis of Monte Luna, established by the Punics, with depositional chambers and pits carved on a rockhill in front of the city settlement (Acropolis). Among the 120 tombs, the finding of Tomb 27, a tomb that included a young woman (T27.2) buried in an atypical prone deposition, having disturbed an earlier burial (T27.1), a subadult around 15 years of age. T27.2 suffered two distinctive types of perimortem trauma, a possible diastatic blunt force trauma to the occipital bone and a small quadrangular-shaped lesion reminiscent of a Roman era square shaped nail. The grave goods allow a quite specific dating to the period of transition between Punic and Roman cultures. These, and other characteristics of the young woman's skeleton, are of significance in understanding funerary and cultural behaviour at the time of this transition.</p>
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5th August 2022

To the attention of the editorial board of the Journal of Archaeological Science: Reports,

I am submitting this manuscript for consideration for publication in an upcoming issue.

The manuscript is entitled “*An unusual case of prone position in the Punic/Roman Necropolis of Monte Luna in Sardinia (Italy): a multi-disciplinary interpretation of Tomb 27*”.

The Monteluna Necropolis in Sardinia shows the transition between the Punics and Romans while they were contesting the control over the Mediterranean basin. Among 120 tombs, one stood out for its unusual characteristics - it contained two individuals with a single set of funerary goods, and one of those individuals was buried in a prone position with evidence of multiple trauma. The individual buried face down was a young woman around 20 years old, with traumatic injuries to her right clavicle and two on the cranium, occurring, respectively, antemortem and perimortem. One of the cranial traumatic lesions, in the frontal bone, has evidence of a penetrating sharp force injury from an object of quadrangular section which resembles the Punic-Roman ritual nails.

The accurate application of anthropological analyses alongside detailed archaeological data and literature sources suggest an osteobiography of significance in understanding funerary and cultural behaviour at the time of Punic-Roman transition.

I declare that this study has not been published elsewhere and that it has not been submitted simultaneously for publication elsewhere. Furthermore, my co-authors and I have no competing interests to state.

Thank you very much for your consideration.

Yours Sincerely,

Rossella Paba

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***An unusual case of prone position in the Punic/Roman Necropolis of Monte Luna in Sardinia (Italy): a multi-disciplinary interpretation of Tomb 27***

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***Highlights:***

- *Understanding past people’s lives based on biological evidence, funerary behaviour, cultural material, and ancient literature*
- *Multiple traumatic lesions associated with prone deposition: an individual osteobiography*
- *An unusual Punic/Roman deposition: a population perspective*
- *Snapshot of the Punic and Roman passage of power over the Mediterranean Sea*

Running head: UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

*An unusual case of prone position in the Punic/Roman Necropolis of Monte Luna in Sardinia (Italy): a multi-disciplinary interpretation of Tomb 27*

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**Keywords:** Bioarchaeology, Taphonomy, Prone position, Punic era, Roman era, Archaeology, Pottery, Coins, Sardinia, Western Mediterranean

27    **Abstract**

28    *Sardinia (Italy), noted for its wealth and strategic position, has been conquered through time*  
29    *by different populations and each one of them instilled their specific culture, ritual*  
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42

## 1. Introduction

In the last few decades, the highly detailed analysis of human skeletal remains, and the people they represented, has seen a significant surge of interest (Buikstra and Beck, 2006). The creation of individual osteobiographies of past people has provided a nuanced understanding of individual lives, as well as adding data to the population perspective potentially allowing larger social phenomena to be examined (Binford, 1971; Domett et al, 2016). Key to the understanding of past people's lives based on their biological evidence, is the consideration of the context in which they lived, their social and physical environment, and died - a truly bioarchaeological approach (Gowland and Knusel, 2006).

A re-examination of an old photograph of Tomb 27 (Figure 1), excavated from the Punic/Roman Necropolis of Monte Luna (Senorbì) in Sardinia, stimulated the present study. The photograph shows human skeletal remains in a prone deposition and surrounded by grave goods. An individual buried in a prone position is often considered deviant (Murphy, E. M., 2008, pp 12 - 17) if it is different than the norm for the period and/or populations on which the examination is focused. It has been widely observed that, regardless of culture, period and geographical area, humans tend to bury some individuals in their society in particular ways, differentiating them in death from others. These usually reflect specific circumstances such as an individual guilty of criminal behaviour, women who died during childhood, and people affected by dangerous and inexplicable diseases or disabilities (Tsaliki A., 2008). While each case reflects specific social and religious beliefs, they can generally be interpreted as an apotropaic way to prevent the person's return from the world of the dead, ensuring their permanent exile from the living community. There are testimonies from the Roman age to Medieval times, both in Italy and in Sardinia (Piga et al., 2015; Quercia, A., Cazzulo, M., 2016), that provide a basis for understanding the case presented here, however, there are some aspects that differ from the common profile of such deviant burials. The aim is to examine all the available archival evidence, the current literature, alongside a detailed archaeological analysis of the region, the time period and grave goods, and the biological data from the skeletal remains themselves. All aspects may have relevance to the interpretation of the symbolic behaviour useful to reconstruct a story of a single individual to understand the ideology of the community that buried them.

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74 *Figure 1 Tomb 27 (Costa, A. M. 1980, tab. XCIII). First layer of excavation exhibiting a prone deposition (red oval); in the*  
75 *right corner, representing a lower layer, is the cranium (yellow oval).*

76

## 2. Archaeological context

### 2.1 Geographic and historical background

The site of Monte Luna is in the central-southern part of Sardinia, near the city of Senorbì, which is 30 km north from Cagliari (Figure 2). The necropolis is thought to be linked to the urban settlement of Santu Teru, a Punic-Roman city active from the 6<sup>th</sup> century BC until mediaeval times, probably as a direct emanation of Cagliari (KRLY in Punic language and Caralis/Carales or Karalis/Karales during the Roman phase). During the Punic phase KRLY was possibly in charge of the entire area where the city of Santu Teru is located. In fact, this settlement is linked to an agricultural economy managed by the city of KRLY under the direction of the main Punic centre of the Western Mediterranean, Carthage. The city of Santu Teru was possibly one of the main urban settlements linked to the management of cereal production, probably wheat, for the Punic city of KRLY and it demonstrated a high level of wealth, as suggested by the majestic funerary artefacts found in the Monte Luna necropolis active from the end of the 6<sup>th</sup> century BC to the Roman Republican age (Todde, 2020). More is known about the settlement of Santu Teru during the Republican and Imperial ages, attested by an inscription (Forci, 2011) which states that the city was active during the first Imperial age. Information regarding the Imperial age phases is disjointed and incomplete. However, the city seems to have survived beyond the end of the Roman Empire dated to the 6<sup>th</sup> century AD as is evidenced by some Late Antique and mediaeval pottery (7<sup>th</sup> - 8<sup>th</sup> c. AD) found near the site of the so-called *acropolis*. The *acropolis* was a place where some scholars had hypothesised the existence of the mediaeval village attested by the agiotoponym of *Santu Teru*, which is linked to a church related to the worship of Saint Theodorus that gives name to the whole area (Costa, Usai 1990).



## UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

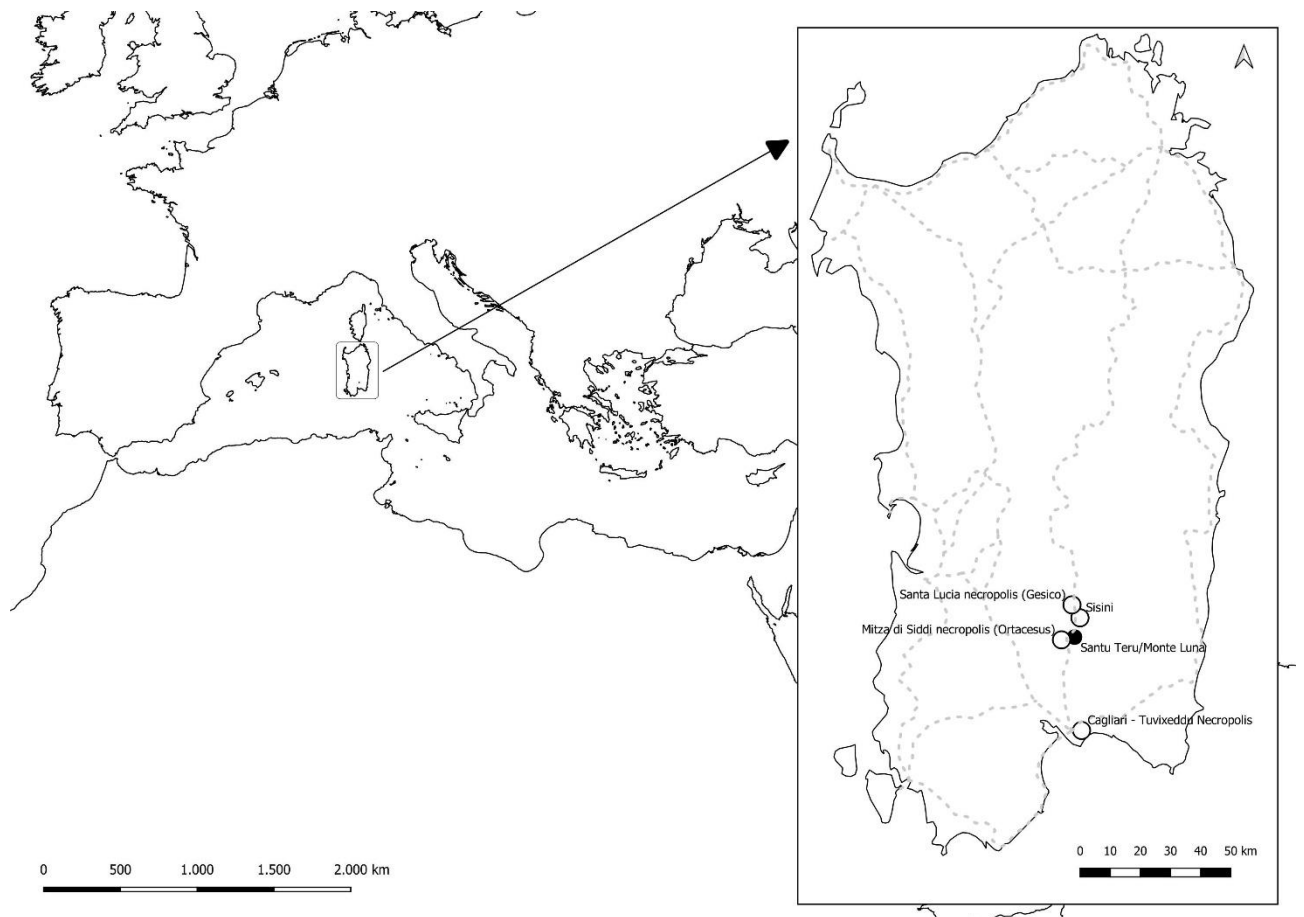


Figure 2 General map of South-East Sardinia (Italy) with the archaeological area of Monte Luna (Senorbi) and other main sites mentioned in the present paper. (Map: D. D'Orlando)

### 2.2 The necropolis of Monte Luna

The necropolis of Monte Luna (Figure 3) was investigated archaeologically during the late 1970s to the early 1980s by Antonio Maria Costa as *Ispettore onorario* (Honorary Inspector) for the local *Soprintendenza ai Beni Culturali* (Superintendent for Cultural Heritage). Only a portion of the necropolis was excavated but at least 120 tombs were partially documented, though there is a significant lack of contextual information recorded (Costa, 1980; 1983a; 1983b; 1983c; Costa, Usai 1990).



Figure 3 Aerial photography of Monte Luna at present. Red arrow indicates Tomb 27 (Aerial photo and planimetry: R. Paba)

During the investigation, Costa describes two different funerary areas. The first, Monte Luna, active from the 6<sup>th</sup> - 2<sup>nd</sup> century BC, located immediately in front of the hill of Santu Teru,

with its wealthy tombs and the second, the *necropoli romana* (Costa, Usai, 1990), a few metres north-west from Monte Luna, which was active from the 2<sup>nd</sup> - 1<sup>st</sup> century BC until the 4<sup>th</sup> - 6<sup>th</sup> century AD. The original funerary area of Monte Luna is composed of chamber tombs with an access pit similar to the ones used in the necropolis of Tuvixeddu in Cagliari, pit-tombs, like Tomb 27, along with other types such as cist tombs and *enchytrismo*i (jar burials) (Costa, 1983c). Some of the tombs, such as Tomb 87, also known as the *tomba principesca*, suggests a number of the inhabitants of Santu Teru were wealthy as they were buried with funerary goods including masterpieces of Magna Graecia jewellery (Usai, 1981; Pisano, 1996). As to the rituals, there is evidence for both inhumation and cremation, but the former is the more common rite (Costa, 1983c). The *necropoli romana* instead is little known and only 10 tombs were excavated. This funerary area is composed of simple rectangular graves and cist tombs and were probably in use after the necropolis of Monte Luna.

## 2.2 The archaeological framework of the Tomb 27

Tomb 27 is a pit-tomb (Figure 3) carved into the stone of the hill of Monte Luna. The funerary artefacts found in this tomb include a pitcher, a *balsamarium* (ointment jar) of Punic production, and a jug and cup of Punic Black gloss-ware, providing evidence of the chronology of the deposition. Two coins and some glass beads that were part of a necklace were also found (Figure 4).





Figure 4 Tomb 27 grave goods. (D. D'Orlando)

The pitcher may be an example of the last evolution of the Cintas 61 type vase, which dates to the 3<sup>rd</sup>-2<sup>nd</sup> century BC. One has clear similarities with some of the vessels from the necropolis of Tuvixeddu (Bartoloni, 2000, pp. 91) and could be considered to suggest a direct commercial, and perhaps cultural, connection between Cagliari and Santu Teru. The coins, one Sardo-Punic and one Roman emission overstruck on an earlier Sardo-Punic coin, are of particular interest (Hersch, 1953). The latter helps to date the context to between the last decade of the 3<sup>rd</sup> century BC and the beginning of the 2<sup>nd</sup>. Even more precise, from a chronological point of view, is the Punic Black gloss pottery cup, identified as a Lamboglia 28F/Morel 2648 form, dated from the end of the 3<sup>rd</sup> until the 2<sup>nd</sup> century BC (Morel, 1981, pp. 200-201). The funerary artefacts of Tomb 27 all confirm that the burial context dates from at least the last decades of the 3<sup>rd</sup> century BC but, given the presence of the other artefacts, a more precise chronology into the early 2<sup>nd</sup> century BC, perhaps from the very first decades, is suggested.

### 3. Anthropological setting

The necropolis of Monte Luna contained 120 tombs with human remains recovered from 70 tombs. All the tombs were re-used, with two or more people in each, up to a maximum of 12 adults within one tomb. Interestingly, when subadults and young children are present in the tomb, it was not re-used for more than one additional individual. Tomb 27 is located near two analogous depositions, Tomb 25 and 28, that both, like Tomb 27, contain two individuals, one adult female and one subadult, and in the case of Tomb 28 with the same genetic traits and presence of grave goods. It is possible that within the necropolis, burials were localised based on familiar lineage. There are multiple tombs with the same deposition of the bodies: in the same stratigraphic unit, along the same line, and archived in the brief excavation information as an adult male, an adult female, and one or more subadults, side by side. Whether the people in this tomb are family, will hopefully be confirmed through DNA analysis in further studies.

Due to poor preservation and comingling of the human remains within tombs, the recording of each tomb is undertaken in a systematic manner as follows: each element is sorted by anatomical region and side, and, where possible, upper limb bones (humerus, radius and ulna) are matched to an individual, as are lower limb bones (ilium, femur, tibia, fibula); for each bone, morphology is described and measurements are taken; then, following standard methods, age-at-death and sex are estimated, and pathology and trauma are described (Buikstra and Ubelaker, 1994; White and Folkens, 2005; Schaefer, Black and Scheuer, 2009).

The minimum number of individuals (MNI), based on the same repeated element within tombs, in the 70 tombs studied has been calculated at 226 adults over 15 years (Brothwell, 1981; Lovejoy, 1985) and 59 subadults between 1-15 years (Schaefer, Black and Scheuer, 2009). No subadults less than 1 year have been found, which suggests the possible presence of a Tophet, a designated funerary area for unborn and newborn perinates, that was common in Phoenician and Punic times (Xella, 2013).

#### 3.1 Human remains from the Tomb 27

Given that the excavation diary was missing, the analysis of the 1977 excavation photograph (Figure 1) was essential in understanding the deposition of Tomb 27. In fact, from the image, it is possible to observe a deep grave (2.10 x 0.8 m) showing two distinct excavation levels. It shows the prone deposition of one articulated skeleton which occupies the entire space of the tomb located in the upper layer, and the location of another deeper deposition, a non-

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articulated skeleton in the upper right corner. Based on the articulated nature of the prone skeleton (ML\_T27.2), it is evident that this individual was the secondary deposition, while the primary, now disarticulated, deposition (ML\_T27.1), is the one in the upper right corner of the pit, evidenced in Figure 1 only by the crania; the postcranial remains were located under it. In support of these observations, iron oxide was found on both individuals: on the anterior proximal part of the humeral metaphases of ML\_T27.2, and on the posterior aspect of the skull and the posterior aspect of the left humeral metaphysis of ML\_T27.1, supporting the prone and supine position, respectively (Figure 5). Seventy-five per cent of the skeletal remains were recovered for both individuals.

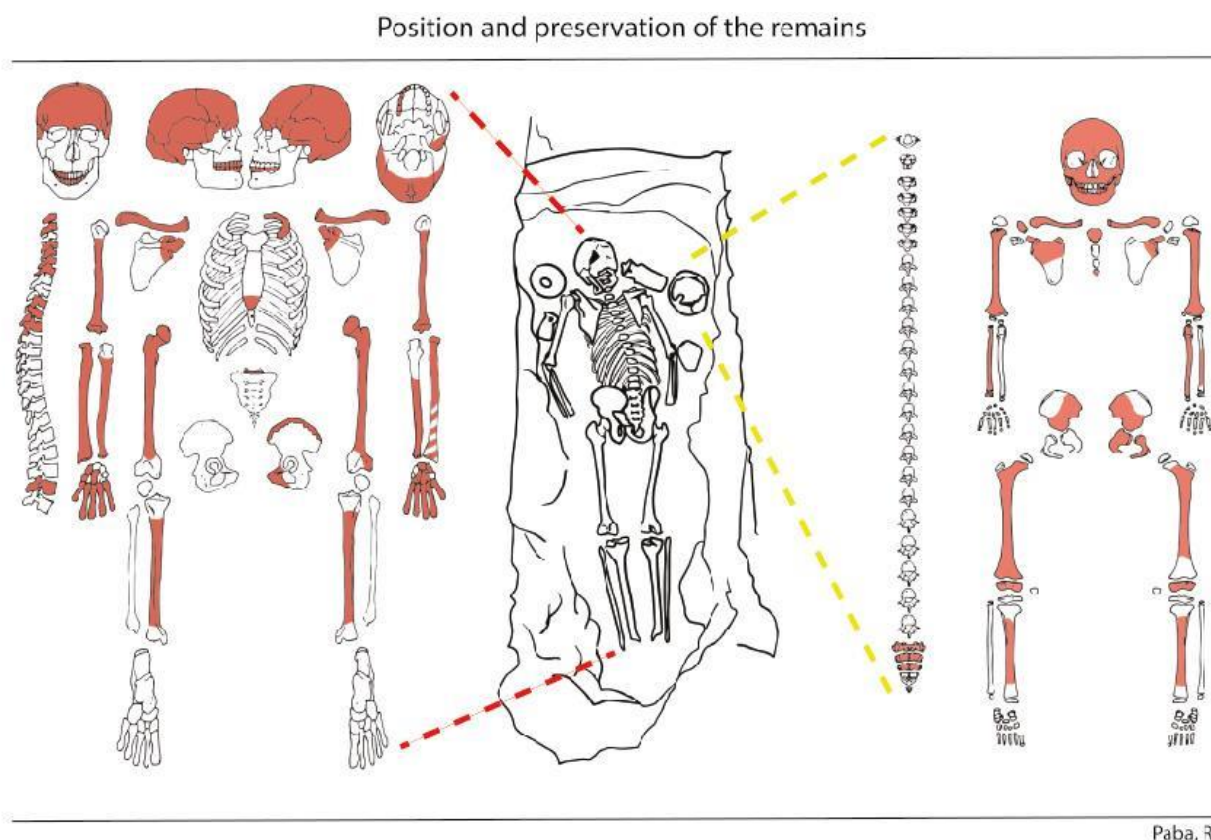


Figure 5 Graphic representation of position and conservation of the human remains from Tomb 27. The yellow lines indicate the cranium around which was found the postcranial remains of T27.1. The preserved remains are indicated in the skeleton schema to the right. The red lines indicate the location of T27.2, found in the prone position, and represented by the preserved remains shaded in the skeletal diagram to the left. (Paba, R.).

201

202 The primary deposition (ML\_T27.1) was estimated to be aged 15 years +/- 3 years based on  
203 tooth eruption and epiphyseal fusion. All second permanent molars were erupted, while the  
204 crowns of the third permanent molars were only half formed and unerupted. In addition, non-  
205 fusion is recorded at the proximal and distal epiphyses of both humeri, the right radius and  
206 the left ulna; the acromion process is partially fused, and the coracoid is unfused in the right  
207 scapula; the three bones of the pelvis are unfused; the unfused distal epiphysis of the right  
208 femur is also present (Schaefer, Black and Scheuer, 2009). Sex was estimated through pelvic  
209 and cranial morphology (Schaefer, Black and Scheuer, 2009), but given the very young age,  
210 skeletal sexual dimorphism may not yet be fully developed, and this estimation awaits further  
211 study, such as through enamel peptide analysis (Stewart et al. 2017).

212 The prone secondary deposition (ML\_T27.2) was estimated to be a young adult female,  
213 based on pelvic and cranial morphology (Buikstra and Ubelaker, 1994), aged between 18-22  
214 years (Schaefer, Black and Scheuer, 2009). Age at death was estimated using a multifactorial  
215 approach including dental eruption, dental wear, and epiphyseal fusion. The femoral head  
216 femur and iliac crest were partially fused. Stature and weight were estimated respectively as  
217 153.0 cm and 49.2 kg (median on a CI of 95% (Manouvrier, 1893; Pearson, 1899; Ruff,  
218 2012). The stature and weight calculations used here are based on generic European  
219 populations, as there are no formulae based on Italians, nor Sardinians. The mean stature of  
220 the people buried in the Necropolis of Monte Luna, based on measurements of 32 adult long  
221 bones is 157.27 cm for women and 160.62 cm for men.

### 222 *3.2 Genetics factors*

223 The cranial vaults of T27.1 and T27.2 both have a retained metopic suture and Wormian  
224 bones at the intersection of the lambdoidal and sagittal sutures (Figure 6). These traits are not  
225 common in the necropolis. In other calvaria with ossicles they are located in other places,  
226 such along the sagittal suture, and not associated with metopism. These 'primary' discrete  
227 traits (Buikstra and Ubelaker, 1994) in both individuals and in the aforementioned Tombs 25  
228 and 28, suggest that there are family areas within the necropolis.

229



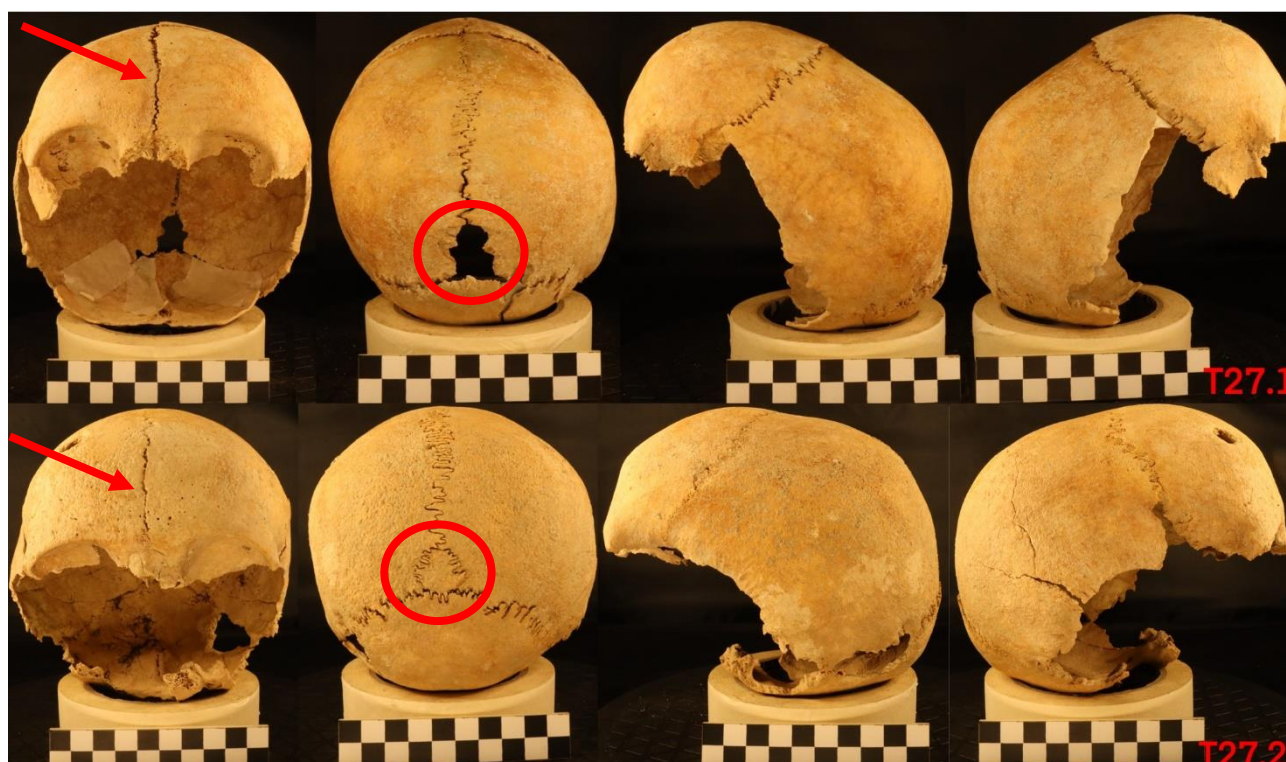


Figure 6 Evidence of metopism (Red arrows) and Wormian bones (Red circles) in T27.1 and T27.2 calvarium (Paba, R.).

The metopic suture usually closes by 2 years of age, though it can close later in childhood (Coppa, A., and Rubini, M., 1996) or adulthood (Zdilla et al. 2018). While some individuals with metopic sutures have been reported to have larger transverse, cranial dimensions suggesting this feature may be related to morphogenesis (Bolk, 1917; Schultz, 1929), this is not the case in T27 and T28 crania. Further support to a more genetic aetiology is the persistence of the metopic suture into adulthood, which can be hereditary and is more common in some ethnic groups than others (Berry & Berry, 1967). There are some external factors, such as frontal sinus abnormalities, or pathological conditions, such as hydrocephaly, that may also cause it to persist (Zdilla et al. 2018) but the above conditions are excluded in T27. In this case, according to the studies of Torgensen (1951) and Sjøvold (1984), metopism is considered to be a hereditary trait.

Lambdoidal Wormian bones are the result of extra ossification centres, but their aetiology is not fully understood (Bellary et al., 2013). In some cases, they are a normal anatomical variation, associated with mechanical stress and the environment (Sanchez – Lara, 2007). For example, in some populations sleeping in a supine position places pressure on the occipital area that can lead to expansion of the occipital suture and brachycephaly (Sanchez – Lara, 2007). This can be excluded in the case of T27.1 and T27.2 because their skulls are not



brachycephalic. In other cases, Wormian bones may be related to specific pathology, such as hydrocephaly or craniosynostosis, but these conditions are usually associated with numerous, more than 10, and large, Wormian bones and arranged in a mosaic pattern and size larger than 6 mm by 4 mm (Bellary et al. 2013). Other factors suggested to be correlated with the development of Wormian bones include epigenetic factors, cranial deformation, craniosynostosis, and premature suture closure, none of which are observed here. Other conditions, such as additive polygenic complex or osteogenesis imperfecta may have Wormian bones associated with them (Coppa and Rubini, 1996; Goto et al. 2004; Semler et al. 2010; Bellary et al., 2013). Wu (2011) reported that geographic and ethnographic patterns in frequency suggest a possible genetic basis, with a low frequency in Europe populations.

The presence of both these variations in both these individuals and the absence of mechanical stress and cranial deformation, may suggest T27.1 and T27.2 were related to each other, but further evidence, such as DNA, would be required to be certain.

Interestingly, in the necropolis the same condition is present in Tomb 28, although the female adult (18-22 years old) has only a thin line of metopism, while the subadult (9+/-3 years old) has a complete opening through the frontal bone up to the coronal suture similar to both individuals in Tomb 27. The Tomb 28 individuals also have Wormian bones located in the lambdoidal suture, with the same shape and number of ossicles (2).

### *3.3 Trauma*

Individual T27.2, the young adult female, presents with multiple traumatic lesions (Figures 7, 8, 9), suggesting the presence of both antemortem and perimortem trauma.

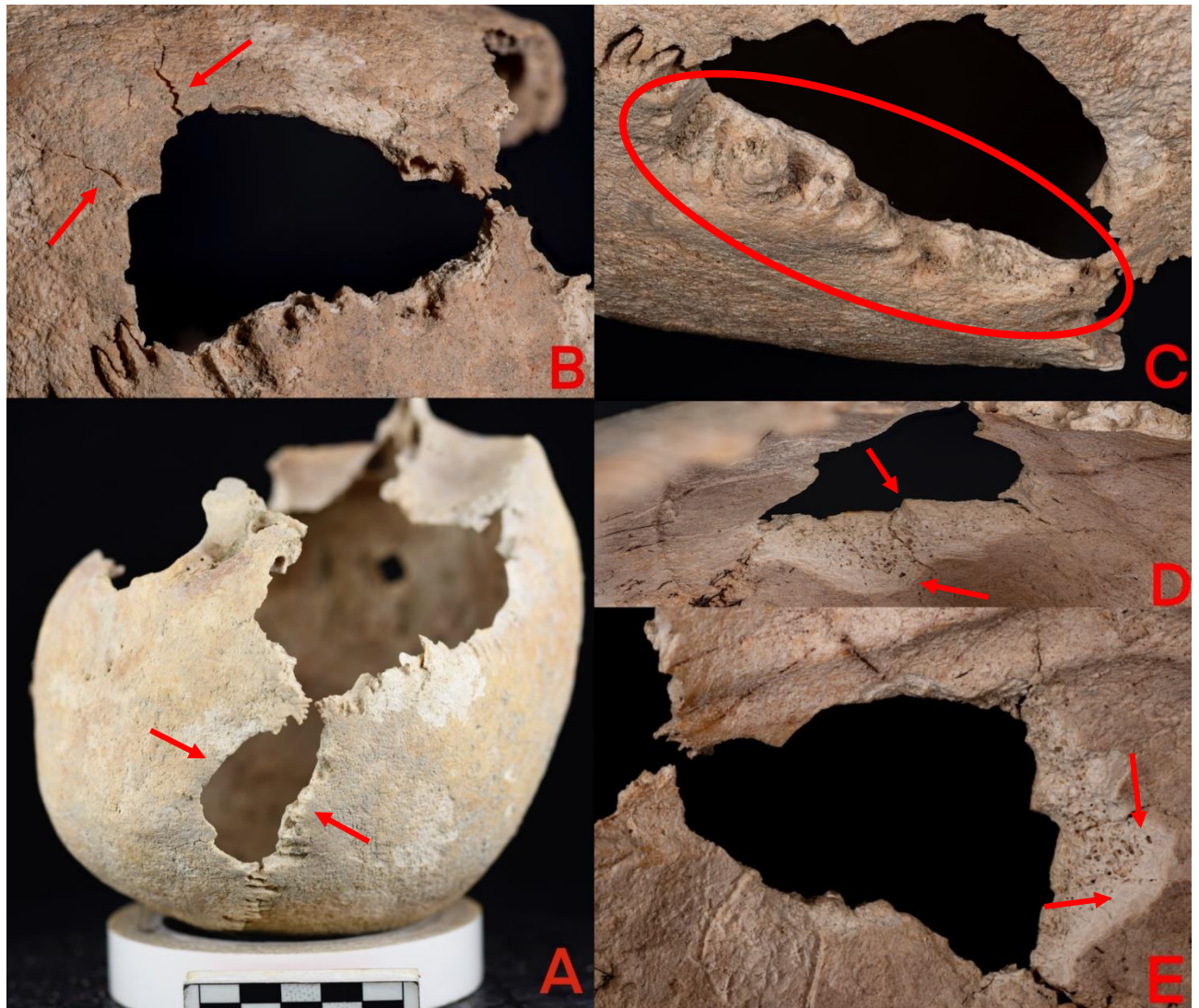
There is a healed fracture in the midshaft of the right clavicle (Figure 7). Healing has resulted in a thickened middle half of the clavicle. These types of fractures often occur in childhood and typically result from axial, longitudinal compressive forces (Nunn et al. 1989) commonly associated with a fall onto the shoulder or the outstretched hand, or from a direct blow to the humerus, either of which could be accidental or the result of intentional violence (Blount 1955; Thornton and Gyll 1999).



Figure 7 Evidence of healed trauma in the midshaft of the right clavicle of T27.2. Superior view (A) with focus on the healed trauma in red rectangle, and posterior view (B), red arrow points at the trauma. (Lai, G.).

Two traumatic injuries are evident on the cranium, possibly occurring peri or postmortem. One triangular-shaped lesion, measuring 41 x 19 mm, is located on the inferior aspect of the left occipital bone, just posterior to the lambdoidal suture (Figure 8) inferior to the hat brim line which is not consistent with an intentional blow (Kremer, 2009). Endocranially, there is an 'exfoliation' of a bone flake (Figure 8D/E) which is commonly seen with blunt force trauma as the force moves from the external aspect, inwards (Wedel and Galloway, 2004). There is also evidence of two short radiating fracture lines out from the medial aspect of the

288 lesion usually associated with a moderate- or high-velocity impact on a common point  
 289 (Kieser et al., 2014) (Figure 8B).



290  
 291 *Figure 8 Evidence of occipital trauma on left lambdoid suture (A) (Paba, R.). B, C, D and E show a focus on the trauma. B*  
 292 *and C focuses on ectocranial surface, red arrows point to the radiating fractures (B) and red oval to osteoclastic reaction*  
 293 *along the lambdoid suture where has been hypothesized a disarticulation due to a diastatic fracture along the suture based*  
 294 *on the supposed point of impact and the evidence in B. D and E shows endocranial perspective in which is possible to*  
 295 *distinct weathering effect from remodelling thanks to the osteoclastic activity. Particular of the trauma from ectocranial*  
 296 *point of view and red arrows to indicate radiating fractures (B-C). Endocranial visual of the trauma with weathering effect*  
 297 *(red arrows in D-E). (Lai, G.)*

298

299 This traumatic lesion is possibly a short radiation fracture along the suture, leading to a  
 300 possible diastatic lesion which caused the left lambdoid suture, at the point of trauma, to  
 301 disarticulate (White et al, 2012, p.434). This suggestion is supported by the observation that  
 302 most of the other sutures (coronal, sagittal, and right lambdoid) are slightly more fused than

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the left lambdoid (Buikstra and Ubelaker, 1994). In Figure 8C, it is possible to see where the disarticulation has occurred as there is a change in the surface of the suture to a rounded and pitted area possibly as a result of osteoclastic reaction within the first week of the trauma (Barbian et al. 2008). There is taphonomic change along the margins of the trauma where weathering and adhering soil has changed the colour and appearance, and the bone flake is missing postmortem (Figure 8D/E). Considering the location of the lesion, the radiating fractures, and the opening along the lambdoid suture, this is likely blunt force trauma either from an object or a fall onto this area of the head.

The second cranial lesion was located on the right side of the frontal bone showing a penetration from the outside inward (Figure 9). The shape (9.5 mm x 9.5 mm) of the lesion suggests a sharp force injury was inflicted using an object with a quadrangular section (Figure 9). Intentional trephination is unlikely as there are no associated cut marks extending out from the lesion that would be consistent with the usual trephination practice in the Roman Era (Tullo, 2010; Giuffra and Fornaciari, 2017). There is a depression and exfoliation around the area of impact in the outer table due to the force of impact, and there is also bevelling of the inner table edges of the lesion (Figure 9) (Barbian et al., 2008; Facchini et al. 2008; Amadasi et al. 2016); both are characteristic of penetrating injuries with a highly localised point of impact associated with considerable power (Wedel and Galloway, 2004). There is no evidence of bone remodelling (Figure 9), suggesting this incident occurred perimortem (Barbian et al., 2008). The shape of the lesion is similar to the cross section of ancient Roman nails. These nails are a common object in Roman settlements excavations in Sardinia (Figure 10).



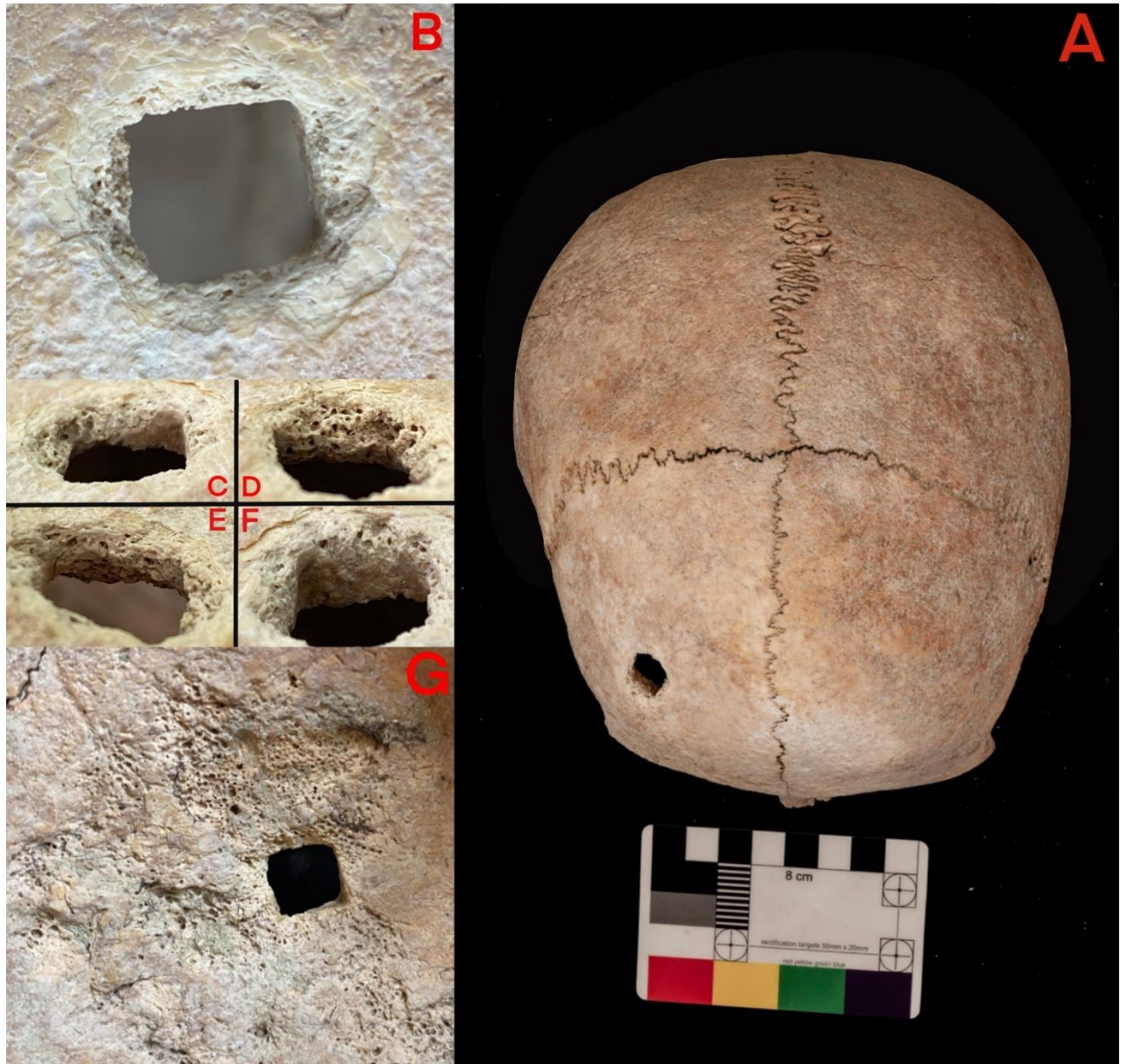


Figure 9 T27.2 skull. Evidence of frontal trauma and obliteration of the sutures are shown (A) (superior view) (Lai, G.). (B-G) Close up of the right frontal bone trauma. (B) ectocranial view of the trauma showing bone flaking. (C - F) close up of the internal edges of the trauma. (C) is the posterior side, (D) is the right side, (E) is the inferior and (F) the left. These edges show exposed diploë due to the trauma. (G) Endocranial view indicating bevelling of the inner table. (Paba, R.).

#### 4. Discussion

The skeletal remains of T27.2, a young woman buried in a tomb at the Monte Luna necropolis, are noteworthy not only because of their unusual prone position, but also for the presence of perimortem trauma. The necropolis, and the people buried within it, is of significant interest from a cultural perspective as it provides an insight into a critical period of transition from the Punic to the Roman dominion for the city of *Santu Teru*.

337 *The trauma and its cultural significance*

338 T27.2 presents with multiple traumatic lesions, one healed fracture of the right clavicle and  
339 two cranial, possibly perimortem, lesions.

340 The cranial lesions are in the posterior aspect of the lambda suture in the occipital bone and  
341 on the right frontal bone. The occipital lesion (Figure 8) is typical of blunt force trauma most  
342 likely from a direct force such as from a fall, landing on the back of the head. Intentional  
343 cranial trauma is often associated with multiple traumatic lesions, often including facial  
344 trauma, and the lesions often occur on the left side (Guyomarc'h et al., 2010). T27.2 does  
345 have trauma on the left side and has another cranial trauma on the frontal bone, however this  
346 lesion does not fit the typical pattern of interpersonal violence-related trauma. In addition, the  
347 posterior fracture is within the 'hat brim line', suggesting the lesion is most consistent with an  
348 injury sustained from a fall (Kremer et al., 2009). It cannot be discounted, however, that the  
349 woman has fallen after being intentionally pushed.

350 The lesion on the right frontal bone, as discussed above, is quadrangular in shape and is  
351 typical of penetrating (sharp force) injuries (Wedel and Galloway, 2004; Amadasi et al. 2016;  
352 Facchini et al. 2008). The distinctive shape of this perimortem lesion is reminiscent of the  
353 square-shaped cross-section of nails commonly used in Roman times. Such nails can be  
354 directly compared to those found in the coeval and nearby site of Sisini (D'Orlando, 2019)  
355 (Figure 10). The Sisini nail has a cross-section of 7.5 mm x 7.5 mm, which, considering the  
356 taphonomic changes, is consistent with the measurement of the trauma (9.5 mm x 9.5 mm).  
357 The nail length is 103 mm and this helps to exclude the possibility that the nail exited at the  
358 occipital lesion, as the sagittal measurement from the frontal trauma to the occipital lesion is  
359 160 mm. The significance of a potential nail being used around the time of death is more  
360 fully discussed below.



Figure 10 Nail from Sisini. (Lai, G.).

### *The burial archaeology*

Tomb 27 is a pit-tomb carved in the stone of the hill of Monte Luna. The funerary artefacts include burial objects from a transition phase between Punic and Roman cultures that date back to the Mid-Republican period of the Sardinian timeline. Based on the contemporary presence of the overstruck coin and the Punic Black gloss pottery cup, Tomb 27 is dated into the 2<sup>nd</sup> century BC perhaps from the first decades of the 2<sup>nd</sup> century BC.

The funerary artefacts also suggest that there was a widespread shared culture in the rural landscape of Cagliari and its hinterland during the Punic-Roman ages. A locally made *balsamarium* (ointment jar) found in Tomb 27, is similar to a form commonly found in the Tuvixeddu necropolis (Bartoloni 2000, p. 91) and in the Santa Lucia funerary area (Gesico, SU) (Tronchetti 1996, pp. 999-1000) (Figure1).

The entire funerary context of Tomb 27, including the placement of objects in the tomb, is more typical of a single deposition, rather than two interments. As supported by the findings in the nearby necropolis of Mitza di Siddi, in which the number of artefacts in singular depositions in Tombs 67 and 113 (same chronology as the Tomb 27 of Monte Luna) (Cocco 2009, pp. 60-63; 80-83) is similar to the number of artefacts in Tomb 27, it is possible to hypothesise that the prone individual, T27.2, may have been interred without any objects. As such, T27.2 may exhibit further evidence of deviancy (Shay, 1985). Therefore, there are

multiple lines of evidence to support the case of Tomb 27 representing an unusual funerary rite: the prone position of the body, the perimortem cranial trauma, and the lack of artefacts.

Ethnographic sources suggest a wide range of reasons for the prone deposition of an individual including as punishment for a perceived fault. For example, the Merovingian King Pepin “asked to be buried face down for the sins of his father” (Taylor, A., 2008, cited in Gilchrist and Sloane, 2005, p. 154). But perhaps the most common explanation is related to *necrophobia*, mostly associated with a fear that the corpse could disturb the living (Tsaliki A., 2008). These transcultural superstitions across the Mediterranean region were linked to witches, werewolves, vampires, and other mythical creatures (Quercia A., Cazzulo M., 2016).

Atypical burial rites have also been associated with contagious diseases and epidemics in antiquity (Tsaliki A., and Taylor, A., in Murphy, E. M., 2008, pp. 18-32; 102-123). For example, *Pliny The Elder*, in *Naturalis Historia* (AD 77), describes a connection between a cross-eyed person and beliefs about an evil eye. This led to Romans’ beliefs around other misunderstood diseases such as epilepsy, or so called *morbo sacro*, that was previously described by Hippocrates of Coos (5<sup>th</sup> century BC) in one of the first scientific treatises written on the topic (Hippocrates, *De Morbo Sacro*, 4). The disease was thought to include a powerful element of impurity both for the individual and for their community since they believed that epilepsy was contagious. For this reason, the treatment of the victims was mostly related to a purification rite dedicated to the divinity responsible for the sickness. *Pliny the Elder* wrote in the 1<sup>st</sup> century AD, that if a person died from an epileptic seizure it was suggested to nail the part of the body in which the trauma began to prevent the diffusion of the disease, miasma, into the community (Pliny the Elder, *Naturalis Historia*, 28 17, 63) and requires purification.

This raises the possibility that the frontal bone lesion in T27.2 was created by a ritual nail, though not necessarily left in the tomb, as other sacred nails usually are as attested in religious contexts elsewhere in the Mediterranean. Sacred nails are usually marked with sacred symbols indicated as *charakteres*, letters and signs inscribed on a magic object, which are common in Graeco-Egyptian, Judeo-Christian, and other religious practices (Bevilacqua 2001). Such sacred objects were associated with auspicious and apotropaic functions. Nails were a powerful symbol in ancient times usually associated with the concept of *defigere*, meaning to fix down or fasten something. In a religious context, these objects are linked to specific rituals. The ritual of the *clavum figendi* (to nail) was used to celebrate recurring or



official events, such as the foundation of a temple or the beginning of a new year. They are linked as well to the *tabulae defixionum*, curse tablets (usually made of lead), which were pierced by nails and hidden in places near to the underworld such as necropolises or wet places as the water was a useful medium to link the living and the dead (Dungworth, 1998). The practice described by Pliny is clearly linked to the power attributed to nails, which could prevent or avoid a particular occurrence (Bevilacqua 2001, p. 133). The use of a ritual nail on a person usually occurred after death, however it is difficult to be certain that the perimortem frontal lesion in T27.2 occurred just before or after death, such is the nature of perimortem injuries.

One such hypothetical explanation for T27.2 may be that they were suffered a series of epileptic seizures that could have first resulted in the clavicle fracture. A subsequent seizure may have led to the blunt force trauma to the occipital bone, perhaps occurring as the woman fell or knocked their head against something hard. In fact, as presented in contemporary clinic literature, people affected by epilepsy are three times more likely to injure themselves and among the most common types of injury (that might be seen on a skeleton) are head injuries, fractures, and dislocations (Nguyen et al., 2009; 2013; Camfield et. al., 2015). The blunt force trauma after an epileptic seizure may have been the cause of death and the sharp force trauma was inflicted around this time to prevent the miasma associated with the epilepsy spreading to the community.

Prone burials are also sometimes carried out on people who have committed particularly harsh crimes (Tsaliki A., and Taylor, A., in Murphy, E. M., 2008, pp. 18-32; 102-123). This is deemed unlikely in this case, based on the evidence that T27.2 was buried in another person's grave, possibly a relative (based on epigenetic factors), within the community necropolis and not an outcast.

#### *Conclusion: Tomb 27 and its wider significance*

The bioarchaeological analysis of a single tomb in the Monte Luna necropolis, Tomb 27, has detailed some striking possibilities around life and death and the cultural perception of these during a period of significant cultural change from Punic to Roman. While, it is clear that T27.2, a young woman, suffered perimortem cranial injuries, the sequence of events and cause of these injuries is not conclusive but give clues and raise the possibility of a significant perimortem funerary rite associated with disease, a nail, and prone burial. This highlights the

potential superstitious nature around death most similar to Roman Era culture, suggesting that Roman cultural practices had already been put in place at this early stage of the transition from Punic to Roman culture. Such analyses can focus on the nuances of life in the past, closer to the day-to-day realities of people in past communities in contrast to the larger scale histories of empires and battles.

## ***CRedIT Declaration***

**Paba R.:** Conceptualization, Methodology, Formal analysis, Investigation, Visualization, Writing - original draft, Writing -review & editing.

**D'Orlando D.:** Conceptualization, Methodology, Formal analysis, Investigation, Visualization, Writing - original draft, Writing -review & editing.

**Willis, A.:** Writing -review & editing.

**Luglie', C.:** Methodology, Review

**Domett, K.:** Conceptualization, Analysis, Writing -review & editing.

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## References

- Amadasi, A., Mazzarelli, D., Merli, D., Brandone, A., Cattaneo, C., 2016. Characteristics and Frequency of Chipping Effects in Near-Contact Gunshot Wounds. *Journal of forensic science*, 62(3), pp. 786-790.
- Barbian, L.T. and Sledzik, P.S., 2008. Healing Following Cranial Trauma. *Journal of Forensic Sciences*, 53: 263-268. <https://doi.org/10.1111/j.1556-4029.2007.00651.x>
- Barnes, E., 2012. Field of Anomalies of the human skeleton. A paleopathology perspective. Wiley-Blackwell, 210pp.
- Bartoloni, P., 2000. La necropoli di Tuvixeddu: tipologia e cronologia della ceramica. *Rivista di Studi Fenici* 28 (1): 79-122.
- Bellary, S.S., Steinberg, A., Mirzayan, N., Shirak, M., Tubbs, R.S., Cohen-Gadol, A.A. and Loukas, M., 2013. Wormian bones: A review. *Clin. Anat.*, 26: 922-927. <https://doi.org/10.1002/ca.22262>
- Berry, A.C., Barry, R.J., 1967. Epigenetic variation in the human cranium. *Journal of Anatomy*, 101: pp. 367-379
- Bevilacqua, G., 2001. Chiodi magici, in *Archeologia classica: rivista del dipartimento di scienze storiche archeologiche e antropologiche dell'antichità*, LII, n.s.2. L'Erma" di Bretschneider, Roma. <https://doi.org/10.1400/258392>
- Binford, L.R., 1981. Behavioral archaeology and the "Pompeii premise". *Journal of anthropological research*, 37 (3): 195-208.
- Blount, W., 1955. *Fractures in children*. Williams and Wilkins, Baltimore.
- Bolk, L., 1917. On metopism. *American Journal of Anatomy*, 22: pp. 27-47
- Brothwell, D.R., 1981. In: *Digging Up Bones: The Excavation, Treatment and Study of Human Skeletal Remains*. Cornell University Press, Ithaca, p. 196.
- Buikstra, J. E., Beck, L. A., 2006. *Bioarchaeology: The Contextual Analysis of Human Remains*, Academic Press, p. 606.
- Buikstra, J. E., Ubelaker, D. 1994. *Standards for data collection from human skeletal remains*, Research series no. 44. Fayetteville, Arkansas: Arkansas archaeological survey research series no 44.

- 504 Camfield, C., and Camfield, P., 2015. Injuries from seizures are a serious, persistent problem  
505 in childhood onset epilepsy: A population-based study. *Seizure*, vol 27, pp. 80-83.  
506 [doi.org/10.1016/j.seizure.2015.02.031](https://doi.org/10.1016/j.seizure.2015.02.031)
- 507 Cocco, D., 2009. *La Necropoli di Mitza de Siddi: Ortacesus*, Nuove grafiche Puddu,  
508 Ortacesus, p. 102.
- 509 Coppa, A., and Rubini, M., 1996. Per la conoscenza del patrimonio biologico umano.  
510 Scheletro & Denti. Atlante caratteri discontinui. *Serie lettera, rassegna, schermaglie e*  
511 *notarelle*. SAL.
- 512 Costa, A.M., 1980. *Santu Teru*, Monte Luna (campagne di scavo 1977-1979). *Rivista di Studi*  
513 *Fenici* 8 (2): 266-270.
- 514 Costa, A.M., 1983a. La necropoli punica di Monte Luna. Tipologia tombale. *Rivista di Studi*  
515 *Fenici* 11 (1): 21-38.
- 516 Costa, A.M., 1983b. Monte Luna: una necropoli punica di età ellenistica. In: Atti del I  
517 Congresso internazionale di studi fenici e punici, Roma, 5-10 novembre 1979: 742-  
518 749. Costa, A.M., 1983c. *Santu Teru*, Monte Luna (campagne di scavo 1980-1982). *Rivista di*  
519 *Studi Fenici* 11 (2): 223-234.
- 520 Costa, A.M., Usai E. 1990. *Santu Teru – Monte Luna*. In: Museo Sa Domu Nosta: 39-73
- 521 D’Orlando, D., 2019. From urban to rural: trade and production between Caralis and its  
522 hinterland (Sardinia, Italy) in IARPOTHP 4 – International association for research on  
523 pottery of the Hellenistic period e.v. Manufacturers and markets the contributions of  
524 Hellenistic pottery to economies large and small, Athens Greece, pp. 11-14
- 525 Domett, K. et al., 2016. Frail, foreign or favoured? A contextualized case from Bronze Age  
526 Northeast Thailand. *The Routledge handbook of bioarchaeology in Southwest Asia*. Taylor and  
527 Francis: 68-94
- 528 Dungworth, D., Mystifying Roman Nails: Clavus Annalis, Defixiones and Minkisi, in  
529 Forcey, C., Hawthorne, J., and Witcher, R. (eds) 1998. TRAC 97: Proceedings of the Seventh  
530 Annual Theoretical Roman Archaeology Conference, Nottingham 1997. Oxford: Oxbow  
531 Books, pp. 148-159
- 532 Facchini, F., Rastelli, E., Belcastro, M.G., 2008. Perimortem cranial injuries from a medieval  
533 grave in St. Peter’s Cathedral, Bologna, Italy. *Int. Journal of Osteoarchaeology*, 18, pp. 421-  
534 430.

## UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

- 535 Forci, A., 2011. L'epigrafe di Marcus Arrecinus Helius: esegesi di un reperto. I plurali di una  
536 singolare iscrizione: atti della Giornata di studi, Senorbì, 23 aprile 2010. *Furnishing A.D.* 43 -  
537 410 (BAR British Series 219). Oxford: Tempus Reparatum
- 538 Gilchrist, R. and Sloane, B. 2005. *Requiem: The Medieval Monastic Cemetery in Britain*.  
539 London: Museum of London Archaeology Service
- 540 Giuffra, V., and Fornaciari, G., 2017. Trepanation in Italy: A Review. *Int. J. Osteoarchaeol.*,  
541 27: 745–767. doi: [10.1002/oa.2591](https://doi.org/10.1002/oa.2591)
- 542 Goto, T., Aramaki, M., Yoshihashi, H., Nishimura, G., Hasegawa, Y., Takahashi, T., Ishii, T.,  
543 Fukushima, Y., Kosaki, K., 2004. Large fontanelles are a shared feature of haploinsufficiency  
544 of RUNX2 and its co-activator CBFB. *Congenit Anom.*, (Kyoto), 44:225–229
- 545 Gowland, R.L., and Knüsel, C.J., 2006. Introduction. In: Gowland, R.L. and Knusel, C.J.  
546 (eds) *Social Archaeology of Funerary Remains*. Oxford: Oxbow Publisher.
- 547 Guyomarc'h, P., Campagna-Vaillancourt, M., Kremer, C., Sauvageau, A., 2010.  
548 Discrimination of falls and blows in blunt head trauma: a multi-criteria approach. *J Forensic*  
549 *Sci.*;55(2):423-7. doi: 10.1111/j.1556-4029.2009.01310.x
- 550 Hersch, C.A., 1953. Overstrikes as evidence for the history of Roman Republican coinage.  
551 *The Numismatic Chronicle and Journal of the Royal Numismatic Society* 13 (43): 33-68.
- 552 Hicks, M., and Hicks, A., 1993. The small objects in Excavations at Otranto. Vol. II: the  
553 finds, vol. II, a cura di Francesco D'Andria e David Whitehouse, pp. 279-313. Congedo  
554 Editore, Lecce. ISBN: 88877864869
- 555 Hillson, S. 2005. Teeth, 373p, *Cambridge Manuals in Archaeology*, Cambridge (2nd  
556 Edition).
- 557 Hippocrates, *De Morbo Sacro*, 4
- 558 Kanz F, Grossschmidt K., 2006. Head injuries of Roman gladiators. *Forensic Sci Int*;160(2-  
559 3):207-16. doi: 10.1016/j.forsciint.2005.10.010.
- 560 Kieser, J., Whittle, K., Wong, B., Waddell, J.N., 2008. Understanding craniofacial blunt force  
561 injury: a biomechanical perspective, *Forensic Pathology reviews*, 5: pp. 39-51. [10.1007/978-](https://doi.org/10.1007/978-1-59745-110-9_3)  
562 [1-59745-110-9\\_3](https://doi.org/10.1007/978-1-59745-110-9_3)
- 563 Kremer, C., and Sauvageau, A., 2009. Discrimination of Falls and Blows in Blunt Head  
564 Trauma: Assessment of Predictability Through Combined Criteria. *Journal of Forensic*  
565 *Sciences*, 54(4): 923-926. doi:10.1111/j.1556-4029.2009.01072

## UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

- 566 Lovejoy, C.O., 1985. Dental wear in the Libben population: Its functional pattern and role in  
567 the determination of adult skeletal age at death. *Am. J. Phys. Anthropol.* 68, 47–56.
- 568 Manouvrier, L., 1893. Les variations du poids absolu et relative du cervelet, de la  
569 protubérance et du bulbe, et leur interprétation, in *Compte rendu de la vingt-deuxième*  
570 *session*, Besançon, Association française pour l'avancement des sciences.
- 571 Meindl, R. S., Lovejoy, O., 1985. Ectocranial Suture Closure: A Revised Method for the  
572 Determination of Skeletal Age at Death Based on the Lateral-Anterior Sutures. *American*  
573 *Journal of Physical Anthropology*, 68(1), pp. 55-66. DOI:[10.1002/ajpa.1330680106](https://doi.org/10.1002/ajpa.1330680106)
- 574 Morel, J.-P., 1981. Céramique campanienne: les formes.
- 575 Murphy, E.M., 2008. Introduction. In: Murphy, E.M., (eds) *Deviant Burials in*  
576 *Archaeological Record*. Oxford: Oxbow Publisher
- 577 Nguyen, R., and Téllez Zenteno, J. F., 2009. Injuries in epilepsy: a review of its prevalence,  
578 risk factors, type of injuries and prevention. *Neurology international*, 1(1), e20.  
579 <https://doi.org/10.4081/ni.2009.e20>
- 580 Nunn, D., Taylor, G. J., Heatley, F. W., 1989 Fractures and dislocations of the clavicle.  
581 *Current Orthopaedics*, 3(4):255–261
- 582 Pearson, K., 1899. Mathematical Contributions to the Theory of Evolution. V. On the  
583 Reconstruction of the Stature of Prehistoric Races. *Philosophical Transactions of the Royal*  
584 *Society of London. Series A, Containing Papers of a Mathematical or Physical Character*,  
585 192: 170-217. University College, London.
- 586 Piga, G. et al., 2015. A unique case of prone position in the primary cremation Tomb 252 of  
587 Monte Sirai Necropolis (Carbonia, Sardinia, Italy). *International Journal of*  
588 *Osteoarchaeology*, 25: 146-159.
- 589 Pisano, G., 1996. *Santu Teru* (Senorbi): note su alcuni gioielli dalla necropoli di Monte Luna.  
590 In: *Nuove ricerche puniche in Sardegna*: 112-122.
- 591 Pliny the elder, AD 77. *Naturalis historia*, 28 17, 63.
- 592 Quercia, A., Cazzulo, M., 2016. Fear of the dead? 'Deviant' Burials in Roman Northern Italy.  
593 In: *TRAC 2015: Proceedings of the Twenty-Fifth Annual Theoretical Roman Archaeology*  
594 *Conference, Leicester 2015*: 28-42.

# UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

- 595 Ruff C., 2012. Body size prediction from juvenile skeletal remains. *American journal of*  
596 *physical anthropology*, 133, 698-716.
- 597 Sanchez-Lara, P.A., Graham, J.M. Jr, Hing, A.V., Lee, J., Cunningham, M., 2007. The  
598 morphogenesis of Wormian bones: A study of craniosynostosis and purposeful cranial  
599 deformation. *Am J Med Genet A*, 143:3243–3251
- 600 Schaefer, M., Black, S. M., & Scheuer, L. 2009. *Juvenile osteology: A laboratory and field*  
601 *manual*. Amsterdam: Academic.
- 602 Semler, O., Cheung, M.S., Glorieux, F.H., Rauch, F., 2010. Wormian bones in osteogenesis  
603 imperfecta: correlation to clinical findings and genotype. *Am J Med Genet A*, 152:1681–1687
- 604 Shay, T., 1985. Differentiated treatment of deviancy at death as revealed in anthropological  
605 and archeological material. *Journal of Anthropological Archaeology*, Vol 4, pp. 221-241
- 606 Sjøvold, T., 1984. A report on the heritability of some cranial measurements and non-metric  
607 traits. In: Van Vark GN, Howells WW, editors. *Multivariate Statistical Methods in Physical*  
608 *Anthropology*. Boston: D. Reidl. pp. 223–246
- 609 Stewart, N. A., Gerlach, R. F., Gowland, R. L., Gron, K. J., Montgomery, J., 2017. Sex  
610 determination of human remains from peptides in tooth enamel. *PNAS*, 114: 52, pp. 13649-  
611 13654. [doi.org/10.1073/pnas.171492611](https://doi.org/10.1073/pnas.171492611)
- 612 Taylor, A., 2008. Aspect of deviant burial in Roman Britain, in Murphy, E.M., (eds) *Deviant*  
613 *Burials in Archaeological Record*. Oxford: Oxbow Publisher, pp. 102-123
- 614 Thornton, A. and Gyll, C., 1999. *Children's Fractures*. Saunders, London.
- 615 Todde, M., 2020. Ricerche sul territorio di Senorbì (Ca) in età Punica. Prime considerazioni.  
616 *Byrsa* (35-36): 111-129.
- 617 Tronchetti, C., 1996. La ceramica della Sardgna romana, in *Materiali Studi Ricerche. Sezione*  
618 *archeologica*, 7: 999-1000.
- 619 Tsaliki, A., 2008. Unusual burials and necrophobia: An insight into the burial archaeology of  
620 fear, in Murphy, E.M., (eds) *Deviant Burials in Archaeological Record*. Oxford: Oxbow  
621 Publisher, pp. 18-32
- 622 Tullo, E., 2010. Trepanation and Roman medicine: a comparison of osteoarchaeological  
623 remains, material culture and written texts. *J R Coll Physicians Edinb*, 40:165–71.  
624 [doi:10.4997/JRCPE.2010.215](https://doi.org/10.4997/JRCPE.2010.215)
- 625 Usai, E., 1981. Su alcuni gioielli della necropoli di Monte Luna, Senorbì. *Rivista di Studi*  
626 *Fenici* 9 (suppl.): 39-47.

## UNUSUAL CASE OF PRONE POSITION IN PUNIC/ROMAN ERA

- 627 Wedel, V. L., and Galloway, A., 2014. *Broken Bones: Anthropological Analysis of Blunt*  
628 *Force Trauma*, 2nd Edition, Springfield, IL: Charles C. Thomas, 479pp.
- 629 White, T.D., Folkens, P.A., 2005. *The Human Bone Manual*. Academic Press.
- 630 Wu, J.K., Goodrich, J.T., Amadi, C.C., Miller, T., Mulliken, J.B. and Shanske, A.L. (2011),  
631 Interparietal bone (*Os Incae*) in craniosynostosis. *Am. J. Med. Genet.*, 155: 287-294.  
632 <https://doi.org/10.1002/ajmg.a.33800>
- 633 Xella, P., Quinn, J., Melchiorri, V., Van Dommelen, P., 2013. Cemetery or sacrifice? Infant  
634 burials at the Carthage Tophet: Phoenician bones of contention. *Antiquity*, 87(338), 1199-  
635 1207. <http://doi.org/10.1017/S0003598X00049966>
- 636 Zdilla MJ, Russell ML, Koons AW, Bliss KN, Mangus KR., 2018. Metopism: A Study of the  
637 Persistent Metopic Suture. *J Craniofac Surg.*, 29(1): 204-208. doi:  
638 10.1097/SCS.00000000000004030. PMID: 29049140.
- 639
- 640





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